UPC at LBNL/U.C. Berkeley

Overview

Kathy Yelick

LBNL and U.C. Berkeley

UPC Team at Berkeley

- Christian Bell: Myrinet conduit (away at school, returning in the Fall)
- Dan Bonachea: GASNet spec, MPI and Quadrics
- Wei Chen: UPC/Open54 compiler
- Jason Duell: Quadrics communication and UPC runtime layer implementation
- Paul Hargrove: VIA, Infiniband, etc.
- Parry Husbands: UPC Applications
- Costin Iancu: UPC/Open64 compiler
- Mike Welcome: IBM/SP communication, moving into applications
- Kathy Yelick: PI

Overview of UPC Effort

Three components:

1) **Compiler**
   - **Portable compiler infrastructure (UPC->C)**
   - **Explore optimizations: communication, shared pointers**
   - **Transfer technology to other UPC compilers**
     - E.g., the HP compiler
2) **Communication support for GAS languages**
   - **Performance evaluation: influence machine vendors**
   - **Tech transfer to ARMCI**
3) **Applications and benchmarks**
   - **Started with NAS PB (MG and CG)**
   - **Mesh generation application this year**

Progress this Year

- The compiler is running!
  - Not gcc 2.9.6 dependent (mostly)
  - Backend changes for C code generator
- GASNet implementations on Quadrics, Myrinet, and LAPI
- New NAS applications:
  - NAS-compliant CG
  - MG done previously
- New mesh generation application
- Papers:
  - Network performance
  - Compiler evaluation
  - GASNet on Myrinet
  - Optimizations (underway)

Agenda

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12:30 Overview -- Kathy Yelick

12:50 UPC Translator and Runtime -- Wei Chen

1:20 GASNet -- Dan Bonachea and Mike Welcome

1:50 Break

2:00 Parallel Optimizations for UPC -- Costin Iancu

2:30 Applications -- Parry Husbands

3:00 Break

3:15 Hardware Discussion -- Paul Hargrove

3:45 Performance of Communication Networks -- Jason Duell

4:15 Discussion and Closing Remarks

Future Plans (1)

- Language
  - Consistency model
  - Progress guarantees
  - Array library (other versions of memcopy)
  - Hierarchical machine support
  - Teams
  - UPC++?

Future Plans (2)

- Translator:
  - Release
    - Beta to UF, Sandia?, GWU?, NSA?
  - Maintenance and tuning
  - Optimizations
    - Single processor performance
    - Privatization
    - Communication overlap and pipelining
    - Software caching
    - Aggregation
  - IA64 backend?
  - Debugging?

Future Plans (3)

- Runtime
  - Shared memory implementation
  - I/O implementation
- GASNet
  - Tuning and maintenance
  - Collectives
  - Strided and scatter/gather
  - X1 port
  - Infiniband port
  - Red Storm port ?
  - BlueGene/L port ?

Future Plans (4)

- Applications
  - SuperLU, starting with Sparse Cholesky
  - PetSc?
  - NAS-like AMR benchmark?
  - Astrophysics code from UCB/McMaster
    - Robert Thacker
  - Sandia (Zhaofang Wen) ?
  - 3D Mesh generation based on Pyramid ?